Century

FRACTIONAL HORSE POWER MOTORS

CHARACTERISTICS AND APPLICATIONS

SOME THINGS WE MAY HAVE FORGOTTEN ABOUT MOTORS

ABOUT MOTORS

SOME THINGS WE MAY HAVE FORGOTTEN

The purpose of this Bulletin is to present in helpful form, information concerning the electrical characteristics of Fractional Horse Power Motors . . . and to suggest how these characteristics can be most effectively applied to motor driven machinery and appliances . . . In addition, there is included a description of several types of Fractional Horse Power Motors produced by Century Electric Company.

CONTENTS

CENTURY ELECTRIC CO. SAINT LOUIS

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HOW TO SELECT THE MOTOR

There are a series of questions involved in the process of properly selecting a motor:

1 *What kind of Electric Current is Available?*

Power Companies in some districts generate both Direct current and Alternating current. Direct current is ordinarily furnished only in commercial centers of the larger cities and alternating current in the outlying districts.

Direct current is generated at various voltages, but alternating current is specified by three factors: voltage—single or polyphase (2 or 3 phase) and frequency in cycles per second. Polyphase current is ordinarily furnished for the larger Industrial and larger Commercial users of power and single phase for smaller Commercial and Domestic Household use. As the most popular application of Fractional horse power motors are for domestic and appliance use, most of these are of the single phase type.

Power Companies also usually have special rules governing the use of motors on their lines; if one is not familiar with the specifications of the power and the rules, it is best to consult the Power Company.

2 *What is the Nature of the Load to be Driven?*

To properly visualize the nature of a revolving load, you may think of the load characteristics as having three definite components, each of which can separately and independently vary over a wide range. These three components can be expressed as:

A . . . *Starting Requirements* — The device may start free, and the load be applied *only* after the motor is up to speed. The device may start with some load applied at starting, but the load is of such a nature that it increases only as the speed builds up. Or, the motor may have to start the full load at zero speed.

B . . . *Acceleration Requirements* — After the instant of starting, regardless of whether it is an easy or hard load to start from zero speed, we must consider the task of bringing the load up to full speed. This is called the load accelerating requirement and has to do with the nature of the work — the machine friction—and the moment of inertia or the fly wheel effect of the driven machine.

C . . . *Full Load Running Requirements* — The third factor involves the requirements of the load after it has accelerated to full load speed. The effect of maximum conditions of temporary overloading must also be considered.

Load requirements are usually expressed in terms of "Torque" which means the foot pounds of turning effort required to rotate the load. Torque is further defined as follows:

A . . . *Static Torque,* or turning effort, to break the load from zero speed.

B . . . *Pull up Torque* (accelerating torque), or turning effort, to accelerate the load up to full operating speed.

C . . . *Break down Torque* or the maximum load that will stall the motor.

If the reader will think of load requirements, translated in terms of these three components of torque it becomes a simple matter to understand the most important requirements of a motor.

In addition to the torque requirements it is also necessary to understand the duty cycle of the load, which involves the duration of the starting period and the frequency of starting.

3 *What Type Motor to Select?*

Motor characteristics are more easily explained when you compare one type with another. To accomplish this in a simple manner, it is necessary to use an average of many sizes of motors and the resulting characteristic is not exact for any particular motor but it serves to demonstrate the main difference between types.

The following data is expressed in percentage of full load torque, which means that if the static torque, for example, is shown as 650%, it would be six and one half times greater than normal or full load torque.

4 *How Do Current Fluctuations Affect Torque?*

The frequency (cycles per second) of alternating current, furnished by the large Power Companies, is practically constant in value and is therefore negligible. The voltage can and does vary to a considerable degree, especially at the end of a transmission line or where the house wiring is too small.

The effective torque output of any motor will vary as the square of the change in applied voltage. This means that a 5% reduction in voltage would reduce the torque output of the motor by 9.7%,

AVERAGE OF FRACTIONAL HORSEPOWER MOTORS

	Repulsion Induction	Capacitor Start	Capacitor Start Capacitor Run	General Purpose Split Phase	Squirrel Cage	Direct Current
Static Torque	550%	435%	378%	230%	300%	650%
Pull up Torque	225%	250%	250%	200%	Will pull up any load they can start	
Break Down Torque	265%	265%	265%	230%	350%	
Power Factor *	64.0%	64.0%	86.0%	73.0%	75.5%	Direct Current
Efficiency *	66.0%	65.0%	65.0%	67.0%	70.0%	70.0%
Locked Rotor Current *	13.0	19.0	18.0	32.0	11.0	15.0

* = ¼ Horse power 4 pole 110 volts, 60 cycle.

The process of selecting a motor then depends:

First, on the current specifications, which automatically determines whether it will be direct current — single phase — or polyphase.

Second, a determination of the horse power and speed and,

Third, a consideration of the torque characteristics of the motor to match the characteristics required for the load.

But this is not all the information necessary to the continued successful operation of the motor. What follows is very important.

etc. Torque ratings are always based on full voltage at the terminals for which the motor is rated.

When a motor starts, there is a heavy in-rush of current which gradually recedes as the motor comes up to speed, and finally drops to normal running current. These current values are called static, pull-up, and running currents and correspond to the production of torques of like name. There is a marked difference in the relative starting current requirements of the various types of motors. A further reference to the chart above indicates actual static current for a 1/4 HP 110 volt motor of the various types required to produce static torques as indicated. This value of static current to produce a

given quantity of static torque is expressed as "starting efficiency".

A relatively high in-rush of current at starting will cause a considerable voltage drop at the motor terminals if the capacity of the feed lines is too small, or if the line is overloaded with too many other current consuming devices. As explained, the result of this reduced voltage is to lower the effective torque.

A motor operating under subnormal voltage conditions, may be able to break the static load, but have difficulty in accelerating the load up to speed. Such a condition lengthens the accelerating period and the high current may tend to cook the winding, blow the condenser or burn the commutator—depending on the type of motor.

Relatively high starting current also causes objectionable light flicker if the capacity of the feed wires is too small.

A rough calculation may be made to determine if the motor is suitable, from a torque standpoint, for the application, by first forecasting the voltage to be expected in different installations at starting at the motor terminals and then applying that voltage by means of an auto transformer.

In applying fractional horsepower motors, remember that the torque the motor is capable of producing in excess of full load torque is provided to take care of the unlooked for and unknown loads which, though but a fraction of a horsepower, are frequently a large per cent of the rated horsepower of the motor.

If overloads are applied for long duration, you may expect an internal rise in temperature sufficient to injure the insulation.

5 *Surrounding Physical Conditions?*

A . . . *The effect of extreme heat* surrounding the motor, (technically called the ambient temperature), increases the operating temperature of the active iron and copper and thus limits the power output of the motor. If the internal temperature of the motor windings is caused to rise beyond the prescribed safe maximum limits, the insulation will be affected and the life of the motor reduced. Some driven loads are substantially increased in the presence of an increase in the temperature of the surrounding atmosphere; hence, unlooked for loads may be imposed upon the motor under such conditions, which may cause internal motor temperature beyond safe limits.

B . . . *The effect of extreme cold* surrounding the motorized device, may cause the oil in both the motor bearings and the oil, or grease, in the driven machine to stiffen. In a machine like a reciprocating pump, or compressor, stiff oil in the bearings, pistons and packings will cause extremely hard starting. The motor should be selected with sufficient starting torque to handle such an emergency condition. The line voltage at the terminals of the motor under starting conditions should be checked so as to be certain that normal starting torque will be maintained.

C . . . *The effect of extreme dampness and moisture, or corrosive acid fumes* reduces the effectiveness of the insulation. This results in current leakage or actual puncture of the insulation. The standard insulation on Century Motors is designed with a considerable surplus to more than handle the normal situation. Where abnormal conditions arise, special insulations are available and should be used.

D . . . *Falling dirt and dirt in suspension, and dripping water* should be prevented from getting into the motor. Where there is an abnormal amount of ordinary dirt in suspension or where the nature of the dirt may be injurious to the motor, an enclosed type motor should be used.

General

The general discussion on motor applications, and the description of the various types in the following pages is not intended to be too technical. It is our hope that the information in this bulletin will assist the Application Engineer in obtaining greater benefits from Century Products.

Our experienced engineers are anxious to help you choose the proper Century Motor.

REPULSION START INDUCTION

[See Bulletin 2-1, Page 1 for integral Horse Power Repulsion Start Induction Motor

Steel encased cushion bumpers mounted on the shaft softens the thud of the shaft shoulder against the bearing, when the rotor moves lengthwise in the bearings at starting or due to crooked belts or pulleys being out of line.

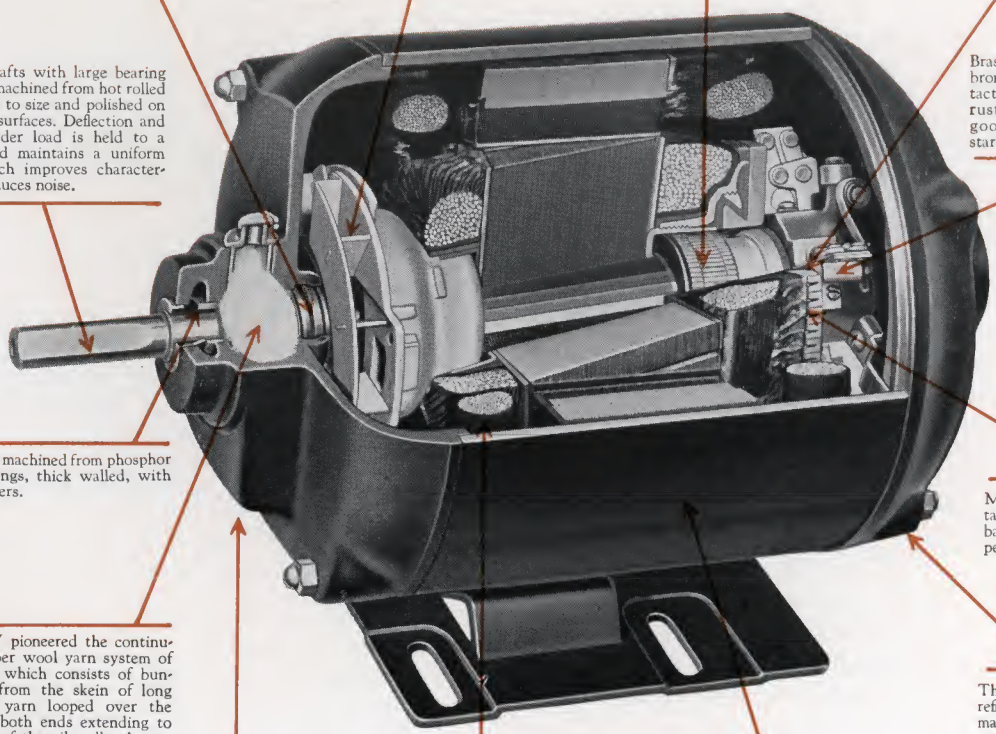
A positive acting governor of steel construction acts with a snap at the pre-determined speed. Steel parts are treated against rusting. CENTURY fractional horsepower governor devices have been proved by years of commercial service in all types of installations and climates, and in laboratory tests of more than a million starts.

Copper short circuiting segments under centrifugal pressure are slid into contact with commutator bars, by a quick acting governor, so effectively short circuiting the rotor winding.

The brushes touch the commutator only during the very short starting period. Large area carbon brushes of the best possible composition to keep a clean contact with the commutator and assure long brush and commutator life.

Stiff steel shafts with large bearing surfaces are machined from hot rolled steel, ground to size and polished on the bearing surfaces. Deflection and vibration under load is held to a minimum and maintains a uniform air gap which improves characteristics and reduces noise.

Brass brush holders and phosphor bronze brush springs make good contact with the brushes. This non-rusting metal assures permanent good contacts and dependable starting.



Bearings are machined from phosphor bronze castings, thick walled, with large shoulders.

Mica insulation between commutator bars and between commutator bars and short circuiting ring assure permanent insulation.

CENTURY pioneered the continuous long fiber wool yarn system of lubrication, which consists of bundles made from the skein of long fiber wool yarn looped over the shaft with both ends extending to the bottom of the oil wells. A continuous flow of filtered oil to the bearings is assured.

The bearing bracket is thick walled, refined grey cast iron, accurately machined, sufficiently strong to assure permanent alignment, and designed to protect the vital parts of the motor against falling objects and dripping water.

Large oil wells hold sufficient oil for at least one year of continuous operation. This allows the motor to be checked when equipment is given an annual inspection. Oil returns prevent waste of oil from the wells.

Windings are thoroughly insulated and saturated into a rigid mass with insulating compound. This protects the windings against dampness and moisture as proved by many hundreds of thousands of installations in damp basements and humid tropical climates throughout the world.

Rigid rolled steel frames results in light weight with greater strength and rigidity. A passage between the core and the frame through which a positive blast of air is blown insures better cooling.

Fig. 915

[Illustrating 63 frame 1/6 horse power 1800 r.p.m. 60 cycle, 110/220 volt motor]

BRUSH LIFTING AND BRUSH RIDING MOTORS

[See Foreword Section Describing Comparative Motor Characteristics]

The Century type RS Repulsion start induction motor has the highest starting efficiency (starting torque per ampere) of any type of alternating current, single phase motor listed in this bulletin.

The electrical principle of the repulsion motor offers the most efficient starting torque. The electrical principle of the single phase induction motor, with squirrel cage rotor, or its equivalent, gives the simplest and most efficient motor when running. The combination of both of these desirable characteristics are obtained in the type RS motor.

Mechanical details are shown in Fig. 915. The type RS motor starts as a repulsion motor, but on reaching a predetermined speed the governor weights expand due to centrifugal force. This movement of the governor is designed to accomplish a dual purpose. The short circuiting device is pushed forward under the commutator and short circuits all

Fig. 998—Illustrating the 63 Frame 1/4 Horse Power 1800 r. p. m. 60 cycle, 110/220 volt Motor.

Fig. 899—Rolled Steel Frame with welded steel feet is strong and rigid. The bore is ground to assure a uniform air gap.

Fig. 895—The Bearing Bracket is a thick walled, refined grey iron casting, accurately machined, sufficiently strong to assure permanent alignment. The Brass Brush Holder and Phospher Bronze Springs make good contact with the brushes.

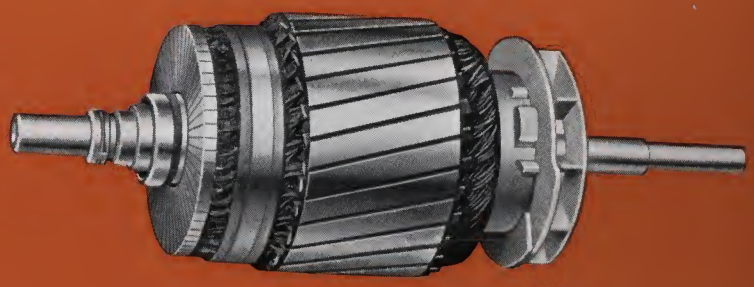


Fig. 906—Mica Insulation is used between the commutator bars and the commutator hub. The outside diameter of the armature is ground to size on all diameters and polished on the bearing surfaces. It has a larger diameter through the rotor iron for greater rigidity.

the commutator bars, through a common copper ring. The same movement releases the tension on the brushes. The result is a short circuited armature, free from brush friction, which, in effect, is the equivalent of the simple squirrel cage rotor as used in the polyphase induction motor. The governor action is entirely automatic; when the motor stops, the mechanism returns to its original starting position. The commutator is in service for only a few seconds during the period of starting, hence, the life of the commutator is practically indefinite.

For a simple basic understanding of how single phase alternating current motors operate, you should keep in mind their comparative action to the polyphase (2 or 3 phase) alternating current induction motor. A polyphase induction motor is inherently self-starting, because the polyphase current in the field winding results in a continuous rotating magnetic pull on the squirrel cage rotor. A straight single phase squirrel cage type induction motor, as such, is not self-starting and a supplementary means must be provided to give the motor the rotating magnetic effect required. However, the single phase induction motor will run and provide torque after it is brought up to speed.

The repulsion start induction run motor develops a continuous rotating effect on the rotor due to the induced currents in the rotor made continuously effective by commutation to produce torque during the starting period.

The mechanical principle in the type RS motor was first used by Century in 1903 on larger motors. Later, in 1914, practically the same mechanism was applied to fractional horse power motors. That basic design has proved itself so thoroughly satisfactory that it is today being used on both small and large type RS motors in practically its original form.

The Century Repulsion start induction motor played a very important part in the early history and in developing public acceptance of Domestic motor powered devices, particularly household refrigerators, house pumps, garage compressors, etc. Hundreds of thousands of Century type RS motors were used in this development before any other motor was developed for the purpose.

APPLICATIONS

While the Century type RS motor is an excellent general purpose motor, it is specially suited for loads requiring high static and accelerating torques in proportion to its full load running torque. The starting efficiency (starting torque per ampere) is the highest of all the AC motors listed and consequently it will have the least current surge and resulting terminal voltage drop at the starting period. If the service power lines are small or working at maximum capacity, the type RS motor will give the least line interference and a minimum light flicker.

The following is a list of some of the many but more popular applications for type RS motors:

Refrigeration Machines
House Pumps
Compressors
Stokers
Conveyors
Blowers and Fans
Machine Tools
Grinders
Oil Burners

Type RS motors are only furnished for single speed applications.

BRUSH LIFTING AND BRUSH RIDING MOTORS

Fig. 998—Illustrating the 63 frame, 1/6 Horse Power 1750 r.p.m. Motor.

[See Foreword Section Describing Comparative Motor Characteristics]

The Century type BR Repulsion Start Brush Riding Motor has the same high starting efficiency (starting torque per ampere) as the type RS Brush Lifting Motor. Electrically, the characteristics are like the type RS Brush Lifting Motor.

The essential difference is in the mechanical construction. The type BR has a horizontal commutator and a short circuiting device which comes into action as the motor comes up to speed and its function is the same as in the type RS Motor. The brushes, however, continue to ride on the commutator after the motor comes up to speed.

The commutator, brush holders, and brushes, are designed for heavy duty and this is one of the main features of its design.

Obviously, the continuous bearing of the brushes on the commutator introduces friction and the more compact overall design slightly reduces the operating efficiency and for the same reason the motor is not as quiet as is the type RS Brush Lifting Motor.

APPLICATIONS

The type BR motor is designed for special applications. Its ability to develop a high starting torque and carry full load while operating as a repulsion motor, makes it adapted to applications for continuous or short-time duty, frequent starting, or where fluctuating voltage is to be expected. For illustration, house pumps, air compressors, etc.

It is an excellent motor for rural conditions, at the end of power lines where the voltage may fluctuate considerably, or where extreme cold may affect the lubrication of the driven load and cause hard or delayed starting.

Type BR motors are only furnished for single speed applications.

Fig. 899—Rolled Steel Frame, welded steel feet, bore ground to size, rigid, accurate.

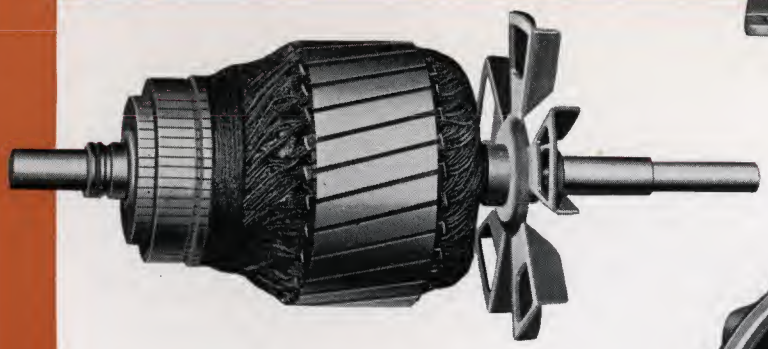


Fig. 1012—Illustrating the Rotor of a 1/6 Horse Power 1800 r.p.m. 60 cycle, 110/220 volt motor. Short circuiting segments operate with a wiping contact.

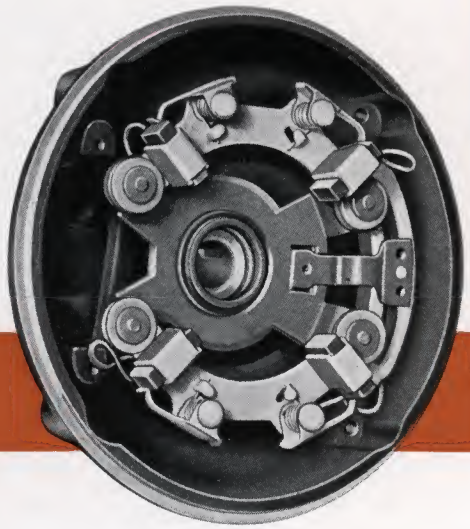


Fig. 1017—Illustrating Bearing Bracket and Brush Holder of a 1/6 Horse Power Motor.

Fig. 1030—Illustrating a cross section of a Bearing, Bearing Housing and Wool Yarn System of Lubrication.

SPLIT PHASE MOTORS

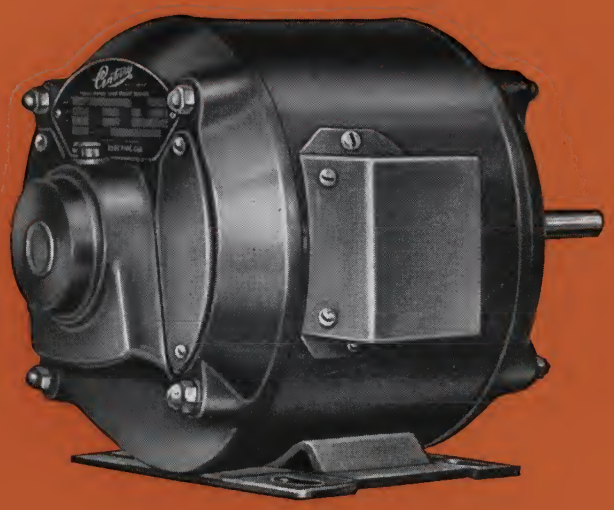


Fig. 908—Illustrating the 63 Frame 1/4 Horse Power 1300 r.p.m. 60 cycle, 110/220 volt Motor.

[See Foreword Section Describing Comparative Motor Characteristics]

The type SP motor has the lowest starting efficiency (starting torque per ampere) of any of the motors listed in this bulletin.

This motor starts as a split phase induction motor and runs as a single phase induction motor. As explained in the type RS motor section of this bulletin, a straight single phase squirrel cage induction motor is not self-starting; supplementary methods must be introduced to obtain the rotating magnetic effect, necessary for self-starting. The type RS, single phase repulsion start induction motor receives its rotating magnetic effect for starting by commutating the induced currents in the rotor. The split phase start, induction motor develops its magnetic rotating effect by splitting the magnetic field (stator). This is the essential difference between the two types of single phase motors.

To make the single phase squirrel cage induction motor self-starting, we must approach the effect of a polyphase squirrel cage (2 or 3 phase) motor. This is accomplished by splitting the magnetic field of the stator winding and is attained by providing two separate windings displaced in space and of different electrical characteristics. These two windings, because of their difference in characteristics, energize magnetically at an angle of approximately 30°, which tends to produce an effect similar to the 90° magnetic angle in the two phase motor. This produces the necessary starting rotation to bring the motor up to running speed.

One winding is called a starting or phase winding, and the other, the main or running winding. The rotor is provided with a positive acting governor which operates a stationary switch. When the motor starts, both windings are on the line and as the motor accelerates up to a pre-determined speed, the governor acts to open the switch and cut out the starting winding. The motor then continues to operate on the running winding. Hence, it starts as a split phase induction motor and runs as a straight single phase induction motor.

The cut open section, Fig. 1054, illustrates the mechanical details, showing the copper Squirrel Cage construction of the rotor. The mechanical details

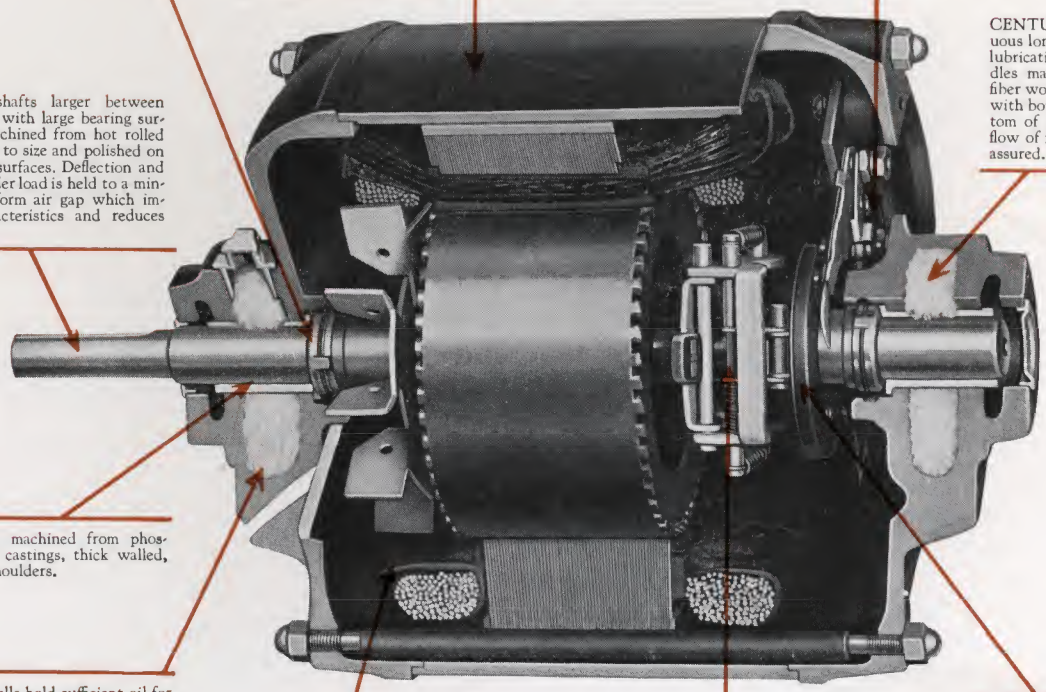
Steel encased cushion bumpers mounted on the shaft softens the thud of the shaft shoulder against the bearing when the rotor moves lengthwise in the bearing at starting or due to crooked belts or pulleys being out of line.

Rigid rolled steel frames result in light weight with great strength and rigidity. A steel fan mounted on the rotor shaft at the drive end, provides a positive blast of cooling air through the passages between the field core and the motor frame.

The starting winding is opened by separating non-pitting silver contacts at a pre-determined speed, by a quick acting governor.

CENTURY pioneered the continuous long fiber wool yarn system of lubrication, which consists of bundles made from the skein of long fiber wool yarn looped over the shaft with both ends extending to the bottom of the oil wells. A continuous flow of filtered oil to the bearings is assured.

Stiff steel shafts larger between bearings and with large bearing surfaces are machined from hot rolled steel, ground to size and polished on the bearing surfaces. Deflection and vibration under load is held to a minimum; a uniform air gap which improves characteristics and reduces noise.



Bearings are machined from phosphor bronze castings, thick walled, with large shoulders.

Large oil wells hold sufficient oil for at least one year of continuous operation. This allows the motor to be checked when equipment is given an annual inspection. Oil returns prevent waste of oil from the wells.

The windings are thoroughly insulated and saturated into a rigid mass with insulating compound. This protects the windings against dampness and moisture as proved by many hundreds of thousands of installations in damp basements and humid tropical climates throughout the world.

A positive acting governor of steel construction acts with a snap at the pre-determined speed. All steel parts are treated against rusting. CENTURY fractional horsepower governors have been proved by more than 24 years of commercial service in all types of installations and climates, and in laboratory tests of more than a million starts.

The Bakelite disk touching steel buttons holds the phase circuit contacts closed when in the starting position. A quick acting governor moves the disk a sufficient distance along the shaft to open the contacts, and to clear the steel buttons.

Fig. 1054

[Illustrating 63 frame 1/6 horse power 1800 r.p.m. 60 cycle, 110/220 volt motor]

show the location of the governor on the shaft in its relation to the switch mounted on the end bracket. The inherent nature of the split phase method of starting motors requires high starting current. Split phase motors can be designed with fairly high starting torque but only with prohibitive starting current. For this reason the conventional split phase motor is purposely designed with relatively low starting torque so that the current and the heating of the starting winding will be kept within reasonable limits.

APPLICATIONS

The Century type SP motor will give excellent results if limited to applications for which this type of motor is suitable. The driven equipment must be easy to start, requiring low static torque. The inertia of the load must be small, so that the motor accelerates rapidly. If the accelerating period lingers too long, the high starting current will injure if not destroy the starting winding. The capacity of the feed wires must be large enough to handle the high starting current or the voltage at the terminals of the motor will be reduced with consequent reduction of the motor torque. If the feed wires are too small this type of motor, at the starting period, will give the greatest line interference and resulting light flicker in the illuminating system.

Among the many applications for which type SP motors are most commonly used are:—

Fans and Blowers (low inertia)
Oil Burners
Small Tools
Washing Machines
Ironing Machines
Cellar Drainers or Sump Pumps

Type SP motors can be furnished for both single and light starting duty multi-speed applications.

Fig. 900—Illustrating 1/6 Horse Power Stator.

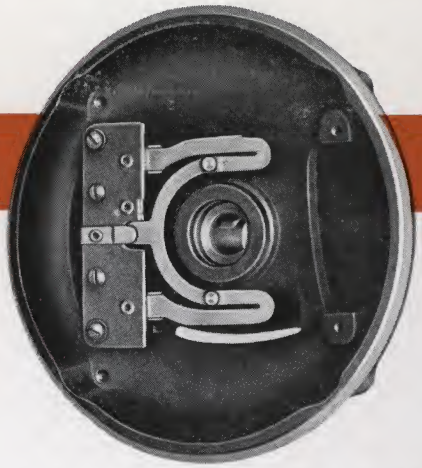


Fig. 1016—Illustrating 1/6 Horse Power end bracket with cut-out and non-pitting silver contacts.

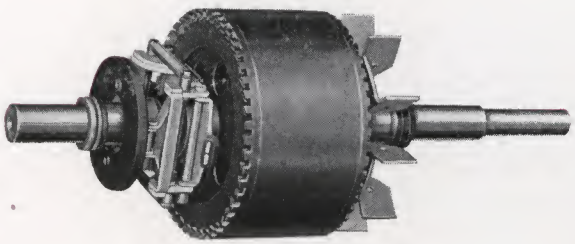


Fig. 893—Illustrating 1/6 Horse Power Rotor.

Fig. 1030—Illustrating a cross section of a Bearing, Bearing Housing and Wool Yarn System of Lubrication.

Fig. 907—Illustrating 63 frame, 1/6 Horse Power 1800 r.p.m. 60 cycle, Capacitor Induction Motor, 110 volt.

Fig. 1006—Illustrating 65 frame, 1/3 Horse Power 1800 r.p.m. Capacitor Start and Capacitor Run Motor with cushion mounting.

CAPACITOR MOTORS

[See Foreword Section Describing Comparative Motor Characteristics]

Capacitor motors are of two kinds:
Type CSH—Capacitor Start Induction Run
Type CPH—Capacitor Start Capacitor Run

The starting characteristics of both of these types of Capacitor Motors are very nearly the same. What we say for one will sufficiently describe the other. The starting efficiency (starting torque per ampere) of the Century Capacitor type motors is very good, however, it is lower than the type RS Repulsion Start Induction Motor, but much higher than the type SP Split Phase Motor.

Basically, a capacitor motor is a split phase motor. It comprises the same mechanical construction and uses a split magnetic field in starting. The improved starting characteristics are obtained by using a capacitor (condenser) in connection with the starting winding.

The Type CSH — Capacitor Start — Induction Run Motor, uses a high capacity, electrolytic type, intermittent duty condenser inserted in series with the starting winding. When the motor accelerates up to a predetermined speed, the centrifugal governor operates the switch and cuts out both the starting winding and the condenser. The motor then operates as a straight single phase squirrel cage induction type motor.

Fig. 900 — Illustrating 1/6 Horse Power Stator.

Fig. 1016—Illustrating 1/6 Horse Power end bracket with cut-out and non-pitting silver contacts.

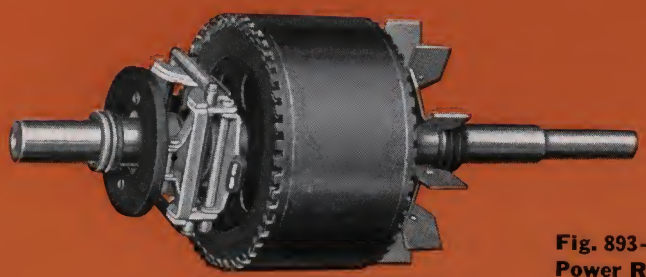


Fig. 893— Illustrating 1/6 Horse Power Rotor.

The electrical effect of the condenser in the starting winding increases the angle of the magnetic action to approximately 90° between the two windings. This results in a closer approach to a true, two phase effect, than is possible with the straight split phase motor. The magnetic action between the stator and rotor is used much more effectively in this manner and produces more starting torque per unit of current.

The Type CPH — Capacitor Start — Capacitor Run Motor, uses two condensers. One condenser is a high capacity electrolytic intermittent duty type and the other is a low capacity continuous duty condenser. When the motor starts, both condensers are in series with the starting winding. When the motor accelerates up to a predetermined speed the governor acts to open the switch and cuts out the intermittent duty condenser. The starting winding and the continuous duty condenser remain in the circuit. The starting winding as used in this motor is really both a starting and running winding.

Some sizes of Capacitor Start — Capacitor Run Condenser Motors use only one condenser and a transformer. The transformer acts to impress a high voltage on the condenser for starting and a low voltage when running. The governor and switch affects the voltage change. The electrical effect of the single condenser operated on the low and high voltage is the same as two condensers.

The two phase effect, in connection with the correction factor of the condenser makes the type CPH a very quiet motor, with relatively high running power factor and efficiency.

For an understanding of the mechanical details of Capacitor Motors, we refer you to the cut open section Fig. 1054, illustrating the type SP motor.

APPLICATIONS

The types CSH and CPH motors are both designed for high static and high accelerating torques. Compared to the type RS motor, the static torque of the capacitor general purpose motor is usually a little lower and the pull up or acceleration torque a little higher. This is because the static torque per unit of current (which must be within accepted limits) for the Capacitor motor is somewhat lower than the type RS.

With some exceptions, the Capacitor Motor is adaptable to the same general kinds of applications for which the Repulsion Start Motor is used. You must be more liberal with the service wire capacity, because the relatively higher starting current results in a greater voltage drop, which in turn has a greater effect on the starting torque output. This also results in a greater degree of light flicker.

Sub-zero temperatures affect the capacity of the conventional electrolytic intermittent duty condensers adversely. A reduction in the capacity of the starting condenser will reduce the effective starting torque of the motor.

A partial list of conventional applications for Capacitor Start Motors follows:

Refrigeration Machines
House Pumps
Compressors
Stokers
Conveyors
Blowers and Fans
Machine Tools
Grinders
Oil Burners

Capacitor Motors can be furnished for both single and multi-speed applications.

POLYPHASE MOTORS

Fig. 975—Illustrating the 63 frame, 1/6 Horse Power 1800 r.p.m. 60 cycle, 220 volt Motor.

(See Bulletin 6-1, page 1, for larger Squirrel Cage Induction Motors)

Fig. 967—Illustrating the 93 frame, 3/4 Horse Power 1800 r.p.m. 60 cycle, 200 volt Motor.

[See Foreword Section Describing Comparative Motor Characteristics]

The type SC Century Fractional Horse Power Squirrel Cage Induction Polyphase Motor has good starting efficiency (starting torque per ampere).

This motor starts and runs as a polyphase (2 or 3 phase) induction motor. The type SC motor has the most simple construction of all the motors listed in this bulletin; nothing but a stationary field with its polyphase windings and a copper conductor squirrel cage rotor revolving in the bearings. Unlike the split phase or split field squirrel cage motor, it has no governor or switch as these are only needed in the split phase type to emulate the polyphase magnetic rotating field effect which is already inherent in the type SC motor.

These fractional horse power type SC motors are mostly used in commercial establishments and in industrial plants, hence, are definitely designed to meet the most rigid industrial requirements and the exacting demands of heavy duty precision production.

APPLICATIONS

As a general rule polyphase motors are seldom used to drive domestic devices. The Public Service Companies ordinarily supply polyphase current only to commercial establishments and industrial plants and single phase current to apartments and private residences, except in the direct current districts.

Polyphase fractional horsepower motors are designed for all general purpose and special applications. Because these motors are used in industrial plants, where ample service capacity is usually provided, starting current is not of such great importance as is the case for domestic requirements.

Type SC motors can be furnished for both single and multi-speed applications.

Fig. 974—Illustrating 3/4 Horse Power Frame and Field Winding.

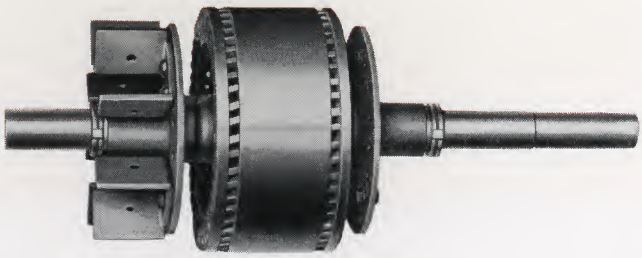


Fig. 971 — Illustrating 3/4 Horse Power Rotor.

Fig. 1033—Illustrating 3/4 Horse Power End Bracket showing air baffle.

DIRECT CURRENT MOTORS

Fig. 998—Illustrating the 63 frame, 1/6 Horse Power 1750 r.p.m. Motor.

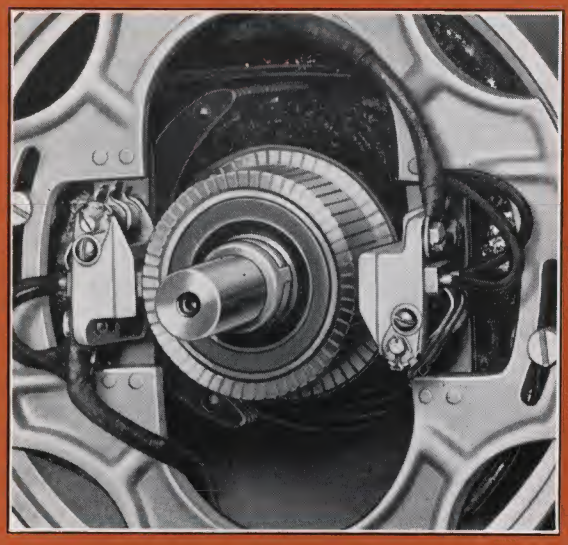


Fig. 996—Illustrating 1/6 Horse Power Brush Holder and Commutator.

(See Bulletin 10-1, page 1, for Integral Horse Power Direct Current Motors)

[See Foreword Section Describing Comparative Motor Characteristics]

The type DM and DN Century Direct Current Motors provide the greatest starting torque per ampere, of any of the various types of motors listed in this bulletin.

The Direct Current Motor is different from the alternating current types in that the magnetic action of both the field and the armature are excited direct from the power supply, whereas in the induction alternating current motor only the field is connected to the power supply.

A commutator and brushes are used to continuously commutate the armature currents to produce a rotating magnetic pull on the armature. The same electrical principle used to start the direct current motor is likewise used for the running operation after the motor is brought up to speed. The brushes, therefore, remain in contact with the commutator and the commutating function is continuous for both *Starting* and *Running*.

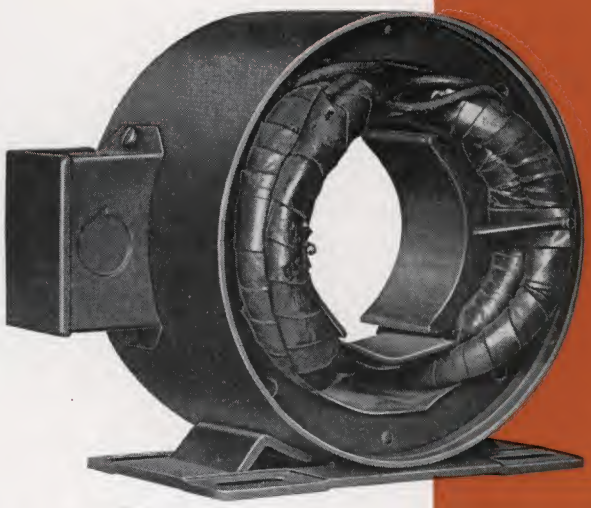


Fig. 970—Illustrating 1/6 Horse Power Frame and Field Winding.

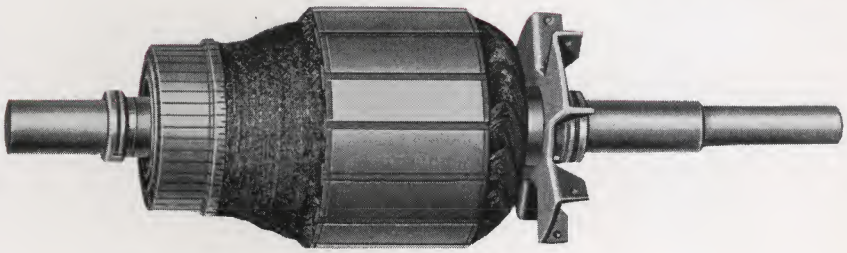


Fig. 968—Illustrating 1/6 Horse Power Armature.

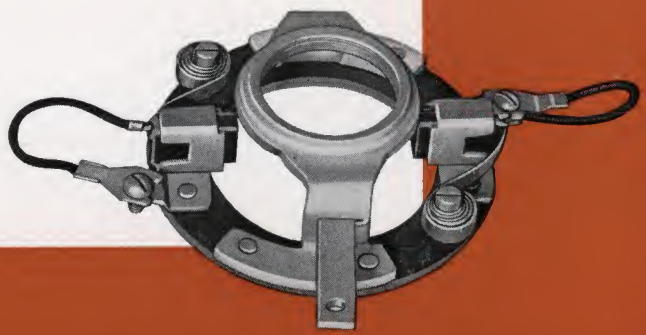


Fig. 972—Illustrating 1/6 Horse Power Box Type Brush Holder and Brush Mechanism.

APPLICATIONS

The Power Companies supply only direct current in the commercial centers of some of our larger cities. Only direct current motors can be used in these direct current districts.

The Century types DM and DN motors can be applied on all the popular applications that were described for all the other types of motors.

Types DM and DN motors can be arranged for both single and adjustable speed applications.

Fig. 1019—Illustrating 1/6 Horse Power Motor Special Pump End Bracket.

Fig. 1014—Illustrating 1/6 Horse Power Flange Type End Bracket.

Fig. 1018—Illustrating 1/6 Horse Power Vertical Motor with Ring Base.

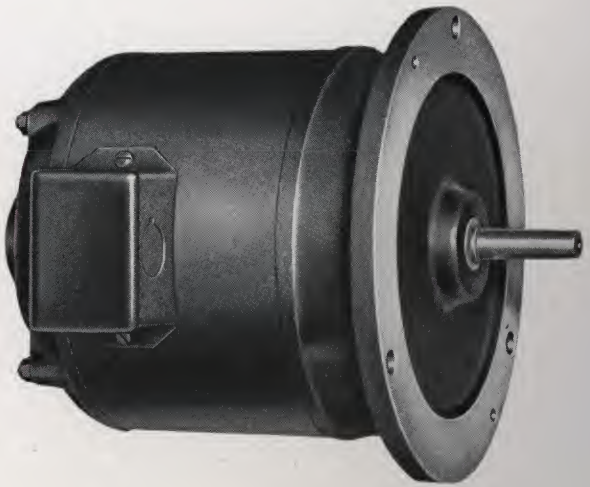


Fig. 1021—Illustrating 1/6 Horse Power Ring Type End Bracket.

Fig. 1026—Illustrating 1/6 Horse Power Flange Type End Bracket (2 ear).

Fig. 912—Illustrating 1/6 Horse Power Type CSH Capacitor Motor Cushion Base.

Fig. 913—Illustrating 1/6 Horse Power Type CSH Capacitor Motor, Cushion Belt Tightening Base.

Fig. 1034—Illustrating 1/6 Horse Power Type RS Ball Bearing Motor.

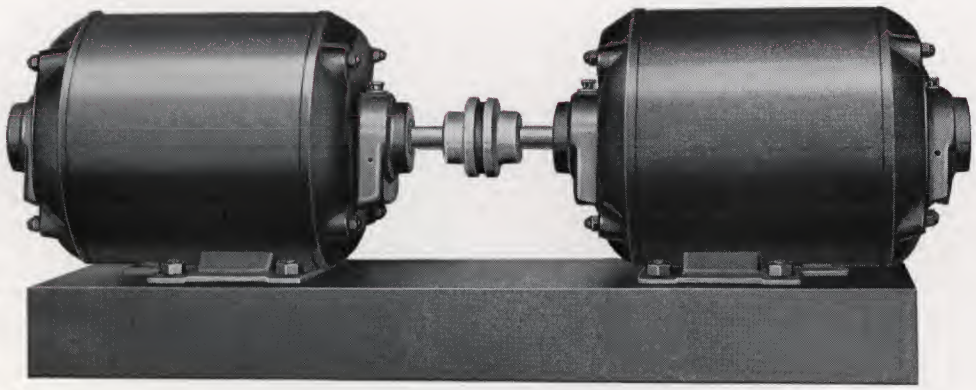


Fig. 1025—Illustrating a Motor Generator Set.

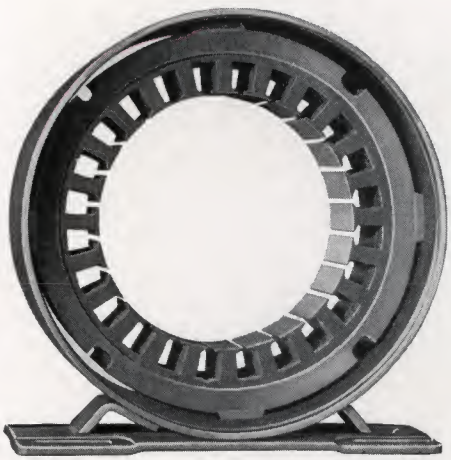


Fig. 1020—Illustrating 1/6 Horse Power Rolled Steel Frame with field iron in place.

Fig. 1015 — Illustrating 3/4 Horse Power Type RS Flange End Bracket.

Century

FRACTIONAL HORSE POWER MOTORS

Fig. 889—Illustrating 1/6 Horse Power Type SP Cushion Mounted Motor.

Fig. 1015 G—Illustrating 3/4 Horse Power Type RS Gear Motor.

CENTURY ELECTRIC COMPANY

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